ANTUSD: A Large Chinese Sentiment Dictionary

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Outline

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- Related Corpora
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- Extended-HowNet (E-HowNet)

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- Results

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Motivation

Sentiment Dictionary

- A building block of sentiment analysis & opinion mining
- Applied as markers or machine learning features

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Augmented NTU Sentiment Dictionary (ANTUSD)

- Lack of Chinese resource
- Big & complete
- Expert labeled sentiment & machine predicted sentiment scores

Related Corpora I

- Words and labels were collected from several sentiment corpora (2006∼2010)

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Word-base, context free

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  - A widely used Chinese sentiment dictionary
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  - Built to test Chinese morphological structure and sentiment

Related Corpora I

- Words and labels were collected from several sentiment corpora (2006∼2010)

Word-base, context free

- NTUSD
  - A widely used Chinese sentiment dictionary
  - Labels: **POS** and **NEG** (2812/8276)
- ACIBiMA
  - Built to test Chinese morphological structure and sentiment
  - Labels: **POS**, **NEU**, **NEG**, **NONOP**, and **NOT**
  - **NONOP** consists of regular non-emotion words
  - **NOT** consists of incorrectly segmented words

Related Corpora II

Sentence-based, context dependent

- NTCIR Multilingual Opinion Analysis Test Dataset
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Properties

- Label process: sentence → sentiment words
- Each word might have conflicting labels
- Labels: **POS**, **NEU**, and **NEG**
- Context information not included in ANTUSD

CopeOpi

Machine predicted sentiment score

- CopeOpi: A Chinese opinion-analysis system
- Sentiment scores of documents, sentences, words, and characters
- Polarity score of each character is calculated statistically
- Word by summing up characters; sentence by summing up words...

Extended-HowNet (E-HowNet)

E-HowNet

- A frame-based entity-relation model extended from HowNet
- Define lexical senses (concepts) in a hierarchical manner
- Now integrated with ANTUSD and covers 47.7% words in ANTUSD

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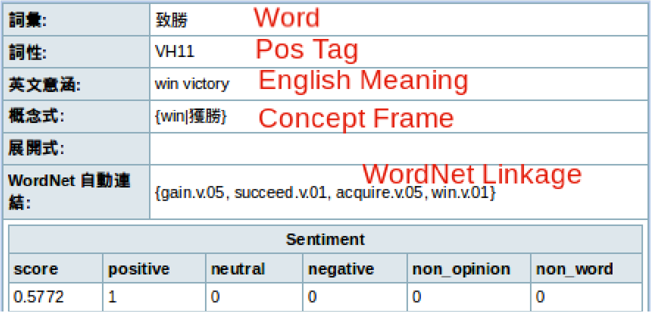

詞彙:	致勝
詞性:	VH11
英文意涵:	win victory
概念式:	{win|獲勝}
展開式:	
WordNet 自動連結:	{gain.v.05, succeed.v.01, acquire.v.05, win.v.01}

Sentiment					
score	positive	neutral	negative	non_opinion	non_word
0.5772	1	0	0	0	0

Word

Pos Tag

English Meaning

Concept Frame

WordNet Linkage

Demonstrative Experiment

Experiment Setting

- Dataset: ANTUSD $\cap$ E-hownet, a total 12995 words
- Classifier: support vector machine (SVM) with linear kernel
- Average over 10-fold validation scores

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Three sentiment analysis tasks

- Opinion extraction: identify opinion words ({**POS**,**NEG**} v.s. **NONOP**)
- Polarity classification: classify opinion words (**POS** v.s. **NEG**)
- Combined tasks (**POS**, **NEG**, **NONOP**)
  - $P = \frac{correct(opinion) \cap correct(polarity)}{proposed(opinion)}$
  - $R = \frac{correct(opinion) \cap correct(polarity)}{gold(opinion)}$
  - $F - score = \frac{2PR}{P+R}$

Preprocessing

Extract single label for each word

1. **NOT**: Count(Not)>0
2. **NONOP**: Count(Non)>0
3. **POS**: Count(Pos)>0 and Count(Neg)=0
4. **NEG**: Count(Neg)>0 and Count(Pos)=0
5. **NEU**: Count(Pos)=0, Count(Neg)=0 and Count(Neu)>0

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4. **NEG**: Count(Neg)>0 and Count(Pos)=0
5. **NEU**: Count(Pos)=0, Count(Neg)=0 and Count(Neu)>0

- Neutral words are dropped since there are only 16 of them
- Words not labeled are also dropped (e.g., Count(Pos)>0 and Count(Neg)>0)

Features

ANTUSD & E-hownet

- CopeOpi score in ANTUSD
- Synonym-Set index (SSI)
  - Concept frame index of a word
  - Each word might belong to many concepts
  - Represented as a binary vector

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Word Embedding

- Corpus: LDC2009T14 (Chinese news)
- Word vectors
- Summation of char vectors

Opinion Extraction

- COP, SSI has lower precision
  - opinion extraction is more semantic-oriented
  - Many words contain single SSI

Feature(s)	Precision	Recall	f-score
COP	0.686	1.000	0.814
SSI	0.693	0.993	0.816
WV	0.784	0.936	0.854
CV	0.765	0.919	0.835
COP+SSI	0.740	0.914	0.818
COP+WV	0.785	0.933	0.853
COP+CV	0.764	0.917	0.833
SSI+WV	0.789	0.937	0.856
SSI+CV	0.772	0.920	0.840
WV+CV	0.808	0.921	0.861

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- Features are complemented; combined features leads to improvement

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Polarity Classification

- COP leads to a significant better result, reflecting is sentiment-oriented nature

Feature(s)	POS f1	NEG f1	Average f1
COP	0.973	0.976	0.974
SSI	0.792	0.842	0.817
WV	0.870	0.895	0.882
CV	0.829	0.851	0.840
COP+SSI	0.979	0.982	0.980
COP+WV	0.981	0.984	0.982
COP+CV	0.967	0.972	0.970
SSI+WV	0.898	0.915	0.907
SSI+CV	0.868	0.886	0.877
WV+CV	0.899	0.916	0.908

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- Combining word vectors and SSI also leads to improvement

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- COP outperforms the others

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WV	0.737	0.767	0.752
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COP+SSI	0.864	0.945	0.903
COP+WV	0.850	0.902	0.875
COP+CV	0.840	0.869	0.854
SSI+WV	0.764	0.796	0.779
SSI+CV	0.732	0.755	0.743
WV+CV	0.764	0.813	0.787

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- Both the numerator of precision and recall are affected by COP's better polarity classification ability
- Only the denominator of precision is affected by COP's worse opinion extraction ability

Precision & Recall

$$P = \frac{correct(opinion) \cap correct(polarity)}{proposed(opinioopinionn)}$$

$$R = \frac{correct(opinion) \cap correct(polarity)}{gold(opinioopinionn)}$$

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- WV+CV outperforms WV due to coverage issue

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Conclusion

- A so far the largest Chinese sentiment dictionary
- Manually sentiment labels & machine estimated sentiment scores
- Three experiments were conducted to demonstrate the usage of ANTUSD

Q & A